(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 651 667 B1

(12) EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention of the grant of the patent:
03.12.1997 Bulletin 1997/49

(21) Application number: **93914923.3**

(22) Date of filing: **09.07.1993**

(51) Int. Cl.[6]: **A61M 31/00**

(86) International application number:
PCT/IE93/00037

(87) International publication number:
WO 94/01165 (20.01.1994 Gazette 1994/03)

(54) MEDICATION ADMINISTERING DEVICE

VORRICHTUNG ZUR VERABREICHUNG VON MEDIKAMENTEN

DISPOSITIF D'ADMINISTRATION DE MEDICAMENTS

(84) Designated Contracting States:
AT BE CH DE DK ES FR GB GR IE IT LI LU MC NL PT SE

(30) Priority: **13.07.1992 IE 922279**
22.02.1993 US 20941

(43) Date of publication of application:
10.05.1995 Bulletin 1995/19

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- **EP-A- 0 494 042**
- **WO-A-91/00753**
- **US-A- 5 062 834**

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Printed by Xerox (UK) Business Services
2.15.1/3.4

Description

Technical Field

The present invention relates to a medication administering device. The invention is particularly useful when embodied in the form of a pill or capsule to be taken orally, and is therefore described below with respect to this application, but it will be appreciated that the invention could be embodied in other types of medication administering devices, such as suppositories to be taken other than orally, or devices to be introduced into a body cavity surgically.

Background Art

A number of different types of medication administering devices have been developed for administering medication in a controlled manner and/or at a predetermined location, in order to maximize the efficacy of the medication. One type, called a "smart" pill, as briefly described in Popular Science, May 1992, Page 25, includes a capsule which is adapted to be swallowed. The capsule contains a tiny radio transmitter that transmits a continuous signal as it passes through the body to thereby permit its location in the body to be detected. When it reaches a predetermined location, a computer signals the pill to release its payload, by actuating a piston within the capsule to force out medication contained within a chamber in the capsule.

International patent publication WO 91/00753 discloses an implantable or ingestible device for delivery of an active principle, comprising two chambers separated by a flexible inner wall. The first chamber contains an electrolyte which produces a gaseous emission when a voltage is applied to a pair of electrodes disposed therein, and the second chamber contains the active principle and is provided with an aperture leading to the outside of the device. When a gas is generated in the first chamber, the first chamber expands and the second chamber is forced to contract, thereby delivering the active principle to the exterior of the device.

Disclosure of Invention

A broad object of the present invention is to provide medication administering devices for administering medication in a controlled manner, and/or at a predetermined location, in order to maximize the efficacy of the medication. A more specific object of the invention is to provide other "smart" pill constructions.

According to the present invention, there is provided a medication administering device, comprising: a housing of a size enabling it to be introduced into a body cavity of a subject; said housing being of a material insoluble in body cavity fluids, but being formed with an opening; a displaceable member in the interior of the housing and defining first and second expansible-contractible chambers therein; said first chamber including said opening and being adapted to receive medication to be delivered through said opening when said device is in the body cavity; and gas generating means for supplying a gas to said second chamber to expand it and thereby to force medication from said first chamber out through said opening into the body cavity, characterised in that said gas generating means is enclosed in a gas permeable, liquid impermeable membrane.

According to further features in the described preferred embodiments, the displaceable member is a diaphragm; in addition, the opening in the device is initially closed by material which is soluble in the body cavity fluids.

According to yet further features in the described preferred embodiments, the gas generating means includes electrically-controlled means for generating a gas when energized. In the described preferred embodiments, the electrically-controlled means includes an electrolytic cell having an electrolyte generating a gas in accordance with the electrical current passed through the electrolyte.

According to yet further features in some described embodiments, the outer surface of the housing includes spaced, diverse metal elements which are bridged by the fluids in the body cavity to generate an electromotive force for supplying current to the electrically-controlled means within the housing. In other described embodiments, the housing includes a battery for supplying current to the electrically-controlled means.

In one described embodiment, the housing further includes a sensor for sensing a condition in the body cavity and for controlling the electrically-controlled means in response thereto. In other described embodiments, the gas generating means is electrically controlled by a radio frequency signal or by a magnetic switch actuated externally of the subject after the device has been introduced into the body cavity, or by a manual switch when the device is introduced into the body cavity.

According to further features in yet another described environment, the housing includes an outer sheath of a liquid-swellable material which swells when in contact with fluids in the body cavity and disintegrates over a period of time in the body cavity, to thereby control the residence time of the device in the body cavity.

As will be more particularly described below, a medication administering device constructed in accordance with some or all of the foregoing features may be used to administer medication at controlled rates, at predetermined times, and/or at predetermined locations, so as to maximize the efficacy of the medication.

Further features and advantages of the invention will be apparent from the description below.

Brief description of Drawings

The invention is herein described, by way of example only, with reference to the accompanying drawings, wherein:

Fig. 1 is a sectional view illustrating one form of device constructed in accordance with the present invention;

Fig. 2 is a side elevational view of the device of Fig. 1;

Figs. 3 and 4 are sectional views illustrating two additional forms of medication administering devices constructed in accordance with the present invention;

Fig. 5 is a side elevational view illustrating the device of Fig. 4;

Fig. 6 is a sectional view illustrating a still further form of medication administering device constructed in accordance with the present invention;

Fig. 7 is a side elevational view illustrating the device of Fig. 6 in its condition within the subject's body cavity;

Fig. 8 is a cut-away view of another form of device constructed in accordance with the present invention; and

Figs. 9 and 10 illustrate a further form of device constructed in accordance with the invention, Fig. 9 illustrating the device in its assembled condition, and Fig. 10 illustrating the device before assembly with its two parts being partially cut-away to show internal structure.

Best Modes for Carrying Out the Invention

The medication administering device illustrated in Figs. 1 and 2 of the drawings is in the form of a pill or capsule to be taken orally. It includes a housing 2 of a size enabling it to be swallowed by the subject. The housing 2 is of a material which is insoluble in the body cavity (e.g. stomach) fluids, but is formed with an opening 4 covered by a plug 6 which is of a material soluble in the body cavity fluids.

Housing 2 further includes a displaceable member, in the form of a diaphragm 8, dividing the interior of the housing into two expansible-contractible chambers C_1, C_2. Chamber C_1 communicates with housing opening 4 and is adapted to receive the medication to be delivered by the device; and chamber C_2 is a control chamber which includes gas generating means for generating a gas to expand chamber C_2, and thereby to contract chamber C_1 to deliver medication from the latter chamber through opening 4 into the body cavity.

Control chamber C_2 thus includes an electrolytic cell generally designated 10, comprising an electrolyte 11 and a pair of electrodes 12, 13 for supplying electrical current to the electrolyte. The electrolyte 11 is of a material which generates a gas according to the amount of electrical current passed through it from the electrodes 12, 13. Preferably, the electrolyte is a solid, e.g., a polymeric gel, and its electrodes are enclosed by a hydrophobic membrane which is permeable by the gas generated in the electrolytic cell, but not permeable by the liquid in the electrolyte. Such electrolytic cells are well known and are described, for example, in U.S. Patent No. 5,062,834.

The device illustrated in Figs. 1 and 2 further includes a pre-programmable microprocessor 14 for controlling the rate of application of electrical current to the electrolytic cell 10, and thereby the rate of delivery of medication from chamber C_1 *via* outlet opening 4.

In the embodiment illustrated in Figs. 1 and 2, the power supplied *via* the microprocessor 14 to the electrolytic cell 10 is generated *in situ* by a pair of spaced metal elements 16, 18 wound in the form of strips on the outer surface of the housing 2. The two metal strips 16, 18 are of diverse metal foils (e.g. gold and silver) defining a galvanic cell such that when bridged by the fluids in the body cavity (e.g. stomach acid), they generate an electromotive force for supplying current to the electrolytic cell 10 under the control of the microprocessor 14.

It will be seen that when the device illustrated in Figs. 1 and 2 is administered orally to a subject, plug 6 dissolves in the stomach fluids, thereby providing communication between the medication chamber C_1 and the body cavity. Microprocessor 14, pre-programmed to control the rate of delivery of the medication from chamber C_1 to the body cavity, controls the flow of electrical current *via* electrodes 12, 13 to the electrolyte 11 of the electrolytic cell 10, and thereby controls the rate of generation of the gas within chamber C_2. The latter chamber is expanded according to the rate of generation of the gas. As a consequence, chamber C_1 is contracted to force medication from chamber C_1 *via* opening 4 to the body cavity according to the rate pre-programmed in microprocessor 14.

Housing 2 may be of any suitable material, such as polyethylene, polycarbonate, etc., which is insoluble in the body cavity fluids and also not deleterious to the body. Plug 6 normally closing opening 4 may be of any suitable material, such as a gelatinous material or other material used in medication capsules, which is soluble in the body cavity fluids, to thereby establish communication between the medication chamber C_1 and the body cavity after the device has been swallowed.

In the device of Figs. 1 and 2, the two metal strips 16, 18 may be helically wound in parallel; however, if a larger voltage is desired than that which can be developed by parallel metal strips, sections of the metal strips can be connected in series to thereby increase the voltage.

Fig. 3 illustrates a device similar to that of Figs. 1 and 2, with the following exceptions:

First, instead of including the diverse metal strips 16, 18 for generating the electrical power, a battery 20 is included within the device for this purpose.

In addition, the device includes one or more sensors (two being shown at 22, 24) for sensing various conditions within the body and for controlling the microprocessor 14 in response thereto. For example, the sensors may be or include any one or more of the following: (1) a pH sensor, to effect the delivery of the medication (e.g. insulin) only to the small intestine, which has a pH different from that of the stomach, or the delivery of an antacid to the stomach when stomach acidity reaches a certain pH level; (2) a temperature sensor to control the delivery of the medication in response to the body temperature; (3) a sound sensor (e.g. a microphone) to control the delivery of the medication (e.g. nitroglycerine) in response to the pulse rate; or (4) a moisture sensor, to start the delivery of the medication only after the device has been swallowed.

In all other respects, the device illustrated in Fig. 3 is constructed, and operates in the same manner, as the device of Figs. 1 and 2, and corresponding reference numerals have been applied to its parts in order to facilitate understanding of its construction and operation.

Figs. 4 and 5 illustrate a device similar to that of Fig. 3, and therefore corresponding elements have also been correspondingly numbered. The device of Figs. 4 and 5, however, includes a control unit 30, e.g., a radio frequency (RF) transmitter/receiver, within housing 2 and connected *via* a connection 32 to an antenna 34 helically mounted on the outer face of the housing. The device of Figs. 4 and 5 thus enables the microprocessor 14 within housing 2 to transmit externally its location, and/or to be controlled externally by an RF transmitter (not shown). The external transmitter may thus control the time and/or the rate of application of electrical current to the electrolytic cell 10, and thereby the location and/or rate of delivery of the medication from chamber C_1 to the body cavity of the subject.

Instead of being a radio frequency transmitter/receiver, control unit 30 in Fig. 4 could be an electrical switch, such as a reed switch, which can be magnetically actuated by a magnetic field externally of the subject.

Figs. 6 and 7 illustrate a further device similar to that of Fig. 3, and therefore its parts are correspondingly numbered, but with the following differences:

A first difference is that the device includes a mechanical switch 40 which may be mechanically actuated, e.g. just before swallowing the device, to actuate the microprocessor 14 controlling the supply of electrical current to electrolytic cell 10.

A second difference is that the device includes a sheath of water-swellable material 42 which, when subjected to the body fluids, expands substantially, as shown in Fig. 7, in order to control the residence time of the device in the subject's body cavity. Sheath 42 is of a material which also dissolves, or is otherwise disintegrated, in the body fluids. An example of a material which can be used for this purpose is ground barley mixed with a starch binder and compressed into a rigid form.

Fig. 8 illustrates another construction, also including a housing 102 of a size enabling it to be swallowed by the subject and of a material which is insoluble in the body cavity (e.g., stomach) fluids. Housing 102 is formed with an opening 104 covered by a plug 106 which is of a material soluble in the body cavity fluids.

Housing 102 further includes a diaphragm 108 dividing the interior of the housing into two expansible-contractible chambers, Ca, Cb. Chamber Ca communicates with housing opening 104 and is adapted to receive the medication to be delivered by the device; and chamber Cb is a control chamber which includes the gas generating means. The latter means is in the form of an electrolytic cell 110 comprising an electrolyte 111 and a pair of electrodes 112, 113 on opposite sides of the electrolyte for supplying electrical current to it. Chamber Cb also includes the microprocessor 114 and electrical circuitry, schematically shown at 115, controlling the microprocessor.

The microprocessor may be pre-programmed to control the time and rate at which electrical current is supplied by the electrodes 112, 113, to the electrolyte 111, and thereby the time and rate of delivery of the medication *via* outlet 104. It will be appreciated that the device of Fig. 8 could also include one or more of the other features described above, such as the diverse electrodes defining a galvanic cell for energizing the electrolytic cell, the sensors for sensing various conditions within the body, the RF control unit, or the magnetically-actuated or manually-actuated switch for controlling the electrolytic cell externally of the subject.

Figs. 9 and 10 illustrate a further variation wherein the device is constructed of two separate parts or housings 200, 300 joined together before the device is introduced into the body cavity, e.g., before being swallowed by the subject. Housing 200 is of a material which is insoluble in the stomach, but preferably bio-degradable in the intestines so that it is not discharged in tact from the subject. Housing 300 is preferably not bio-degradable, i.e. insoluble in the stomach and in the intestines. Housing 300 is of circular shape, and housing 200 is formed with a side 202 of concave configuration to accommodate housing 300.

Housing 200 is adapted to receive the medication and is formed with the outlet opening 204 normally covered by the plug 206 made of a material soluble in the stomach fluids. It includes the displaceable diaphragm 208 dividing its interior into the medication chamber C_{11} and the control chamber C_{12}.

Housing 300 includes the gas-generating elements. The gas is fed into the control chamber C_{12} *via* an opening 209 formed in housing 200, and another opening 309 formed in housing 300 when the two housings are fixed together as shown in Fig. 9. The gas is generated by an electrolytic cell 310 comprising an electrolyte 311

and electrodes 312, 313 on its opposite sides. A microprocessor 314 and control circuitry 315 control the time and rate of delivery of electrical current to the electrolytic cell, and thereby the time and rate of delivery of gas *via* openings 309 and 209 to the control chamber C_{12} in housing 200, and the time and rate of delivery of the medication from chamber C_{11} in housing 200 *via* the outlet opening 204.

The variation illustrated in Figs. 9 and 10 may also include the features of any of the other described embodiments.

While the invention has been described with respect to several preferred embodiments, it will be appreciated that many other variations of the invention may be made. Thus, other propelling means could be used, or other gas generating means could be included in chamber C_2. For example, there could be used a material which decomposes to generate a gas when subjected to body fluids entering the device *via* an opening initially covered by a dissolvable plug corresponding to opening 4 and plug 6 with respect to chamber C_1. In addition, the diaphragm 8 could be another form of displaceable member, e.g. a piston. Further, the device could be embodied in a capsule or suppository to be taken other than orally, or could be introduced into a body cavity surgically, or could be implanted subcutaneously. Many other variations, modifications and applications of the invention will be apparent.

Claims

1. A medication administering device, comprising:

   a housing (2) of a size enabling it to be introduced into a body cavity of a subject;

   said housing (2) being of a material insoluble in body cavity fluids, but being formed with an opening (4);

   a displaceable member (8) in the interior of the housing (2) and defining first and second expansible-contractible chambers (C1, C2) therein;

   said first chamber (C1) including said opening (4) and being adapted to receive medication to be delivered through said opening (4) when said device is in the body cavity;

   and gas generating means (10) for supplying a gas to said second chamber (C2) to expand it and thereby to force medication from said first chamber (C1) out through said opening (4) into the body cavity, characterised in that said gas generating means (10) is enclosed in a gas permeable, liquid impermeable membrane.

2. A device according to Claim 1, wherein said displaceable member (8) is a diaphragm.

3. A device according to Claim 1 or 2, wherein said opening (4) is initially closed by a material (6) which is soluble in the body cavity fluids.

4. A device according to any one of Claims 1-3, wherein said gas generating means (10) includes electrically-controlled means (11-14) for generating a gas when energized.

5. A device according to Claim 4, wherein said electrically-controlled means (11-14) includes an electrolytic cell (11-13) having an electrolyte (11) generating a gas in accordance with the electrical current passed through the electrolyte (11).

6. A device according to Claim 5, wherein said device further includes a pre-programmable microprocessor (14) for controlling the electrical current to said electrolytic cell (11-13) and thereby the time and rate at which medication is forced out of said first chamber (C1).

7. A device according to Claim 4, wherein the outer surface of the housing (2) includes spaced, diverse metal elements (16, 18) which are bridged by the body cavity fluids to generate an electromotive force for supplying current to the electrically-controlled means (11-14).

8. A device according to Claim 7, wherein said diverse metal elements (16, 18) are in the form of spaced strips wound on the outer surface of said housing.

9. A device according to any one of Claims 4-6, wherein said housing (2) includes a battery for supplying current to the electrically-controlled means.

10. A device according to any one of Claims 4-9, wherein said housing (2) includes a sensor for sensing a condition in the body cavity and for controlling said electrically-controlled means (11-14) in response thereto.

11. A device according to any one of Claims 4-9, wherein said housing (2) further includes a radio frequency receiver for receiving a radio frequency signal for controlling said electrically-controlled means (11-14).

12. A device according to any one of Claims 4-9, wherein said housing (2) further includes an electrical switch manually actuatable from externally of the housing (2) for actuating said electrically-controlled means (11-14).

13. A device according to any one of Claims 4-9, wherein said electrically-controlled means (11-14)

includes an electrical switch magnetically actuated by a magnetic field externally of the subject.

14. A device according to any one of Claims 1-13, wherein said housing (2) includes an outer sheath of a liquid-swellable material which swells when in contact with body cavity fluids and disintegrates over a period of time in the body cavity, to thereby control the residence time of the device in the body cavity.

15. A device according to any one of Claims 1-14, wherein said gas generating means (10) in said second chamber.

16. A device according to any one of Claims 1-14, wherein said gas generating means is included in a second housing which is attached to the first-mentioned housing when introduced into the body cavity of a subject and which is also of a material insoluble in the body cavity fluids, the two housings being formed with aligned openings for feeding gas generated in said second housing into said second chamber of the first-mentioned housing.

17. A device according to any preceding claim, further comprising

a plug (6) which is soluble in the body cavity fluids closing said opening (4).

18. A device according to any preceding claim, wherein said device further includes a pre-programmable microprocessor (14) for controlling the time and rate of gas generation by said gas generating means (10), and thereby the time and rate at which said medication is forced out of said first chamber (6).

Patentansprüche

1. Arznei-Verabreichungsvorrichtung, aufweisend:

ein Gehäuse (2) von einer Größe, die es ermöglicht, in eine Körperhöhle einer Person eingeführt zu werden;
wobei das Gehäuse (2) aus einem Stoff besteht, der in den Körperflüssigkeiten unlöslich ist, das aber mit einer Öffnung (4) versehen ist;
ein verschiebbares Element (8) im Inneren des Gehäuses (2), das erste und zweite ausdehnbare-zusammenziehbare Kammern (C1, C2) enthält;
wobei die erste Kammer (C1) die genannte Öffnung (4) enthält und angepaßt ist, die durch die Öffnung (4) zuzuführende Arznei aufzunehmen, wenn sich die Vorrichtung in der Körperhöhle befindet;
und Gaserzeugungsmittel (10) zum Liefern eines Gases an die zweite Kammer (C2), um sie zu expandieren und dadurch die Arznei aus der ersten Kammer (C1) durch die Öffnung (4) in die Körperhöhle auszustoßen,
dadurch gekennzeichnet, daß
das Gaserzeugungsmittel (10) in einer gasdurchlässigen, flüssigkeitsdichten Membran eingeschlossen ist.

2. Vorrichtung nach Anspruch 1, bei der das verschiebbare Element (8) ein Diaphragma ist.

3. Vorrichtung nach Anspruch 1 oder 2, bei der die Öffnung (4) anfänglich durch einen Stoff (6) geschlossen ist, der in den Körperflüssigkeiten löslich ist.

4. Vorrichtung nach irgendeinem der Ansprüche 1 bis 3, bei der das Gaserzeugungsmittel (10) elektrisch gesteuerte Einrichtungen (11-14) umfaßt, die Gas erzeugen, wenn sie mit Energie gespeist werden.

5. Vorrichtung nach Anspruch 4, bei der die elektrisch gesteuerten Einrichtungen (11-14) eine elektrolytische Zelle (11-13) mit einem Elektrolyten (11) umfassen, der ein Gas gemäß dem durch den Elektrolyten (11) geleiteten elektrischen Strom erzeugen.

6. Vorrichtung nach Anspruch 5, die weiter einen vorprogrammierbaren Mikroprozessor (14) zum Steuern des der elektrolytischen Zelle (11-13) zugeführten Stromes und dadurch der Zeit und Rate umfaßt, gemäß der die Arznei aus der ersten Kammer (C1) ausgestoßen wird.

7. Vorrichtung nach Anspruch 4, bei der die äußere Oberfläche des Gehäuses (2) beabstandete, diverse metallische Elemente (16, 18) aufweist, die durch die als Brücke dienenden Körperhöhlenflüssigkeiten verbunden werden, um eine elektromotorische Kraft zur Lieferung von Strom an die elektrisch gesteuerten Einrichtungen (11-14) zu erzeugen.

8. Vorrichtung nach Anspruch 7, bei der die diversen Metallelemente (16, 18) die Form von beabstandeten Streifen aufweisen, die auf die äußere Oberfläche des Gehäuses gewickelt sind.

9. Vorrichtung nach irgendeinem der Ansprüche 4 bis 6, bei der das Gehäuse (2) eine Batterie zum Liefern von Strom an die elektrisch gesteuerten Einrichtungen enthält.

10. Vorrichtung nach irgendeinem der Ansprüche 4 bis 9, bei der das Gehäuse (2) einen Sensor zum Erfassen eines Zustandes in der Körperhöhle und

zum Steuern der elektrisch gesteuerten Einrichtungen (11-14) als Reaktion darauf enthält.

11. Vorrichtung nach irgendeinem der Ansprüche 4 bis 9, bei der das Gehäuse (3) weiter einen Radiofrequenzempfänger zum Empfangen eines Radiofrequenzsignals zum Steuern der elektrisch gesteuerten Einrichtungen (11-14) enthält.

12. Vorrichtung nach irgendeinem der Ansprüche 4 bis 9, bei der das Gehäuse (2) weiter einen elektrischen Schalter aufweist, der von außerhalb des Gehäuses (2) her manuell betätigbar ist, um die elektrisch gesteuerten Einrichtungen (11-14) zu betätigen.

13. Vorrichtung nach irgendeinem der Ansprüche 4 bis 9, bei der die elektrisch gesteuerten Einrichtungen (11-14) einen elektrischen Schalter aufweisen, der magnetisch durch ein außerhalb der Person befindliches magnetisches Feld betätigt wird.

14. Vorrichtung nach irgendeinem der Ansprüche 1 bis 13, bei der das Gehäuse (2) eine äußere Hülle aus einem durch Flüssigkeit anschwellbaren Stoff umfaßt, der anschwillt, wenn er sich in Berührung mit Körperhöhlenflüssigkeiten befindet und sich in der Körperhöhle über eine Zeitdauer hinweg zersetzt, um so die Verweilzeit der Vorrichtung in der Körperhöhle zu steuern.

15. Vorrichtung nach irgendeinem der Ansprüche 1 bis 14, bei der das Gaserzeugungsmittel (10) sich in der zweiten Kammer befindet.

16. Vorrichtung nach irgendeinem der Ansprüche 1 bis 14, bei der das Gaserzeugungsmittel in einem zweiten Gehäuse enthalten ist, das am ersterwähnten Gehäuse befestigt wird, wenn dieses in die Körperhöhle einer Person eingeführt wird, und das ebenfalls aus einem in den Körperhöhlenflüssigkeiten lösbarem Stoff besteht, wobei die beiden Gehäuse mit untereinander ausgerichteten Öffnungen zum Zuführen des im zweiten Gehäuse erzeugten Gases in die zweite Kammer des ersterwähnten Gehäuses ausgebildet sind.

17. Vorrichtung nach irgendeinem vorhergehenden Anspruch, die weiter einen Stopfen (6) umfaßt, der in den Körperhöhlenflüssigkeiten lösbar ist und die Öffnung (4) schließt.

18. Vorrichtung nach irgendeinem vorhergehenden Anspruch, bei der die Vorrichtung weiter einen vorprogrammierbaren Mikroprozessor (14) zum Steuern der Zeit und Rate der Gaserzeugung durch das Gaserzeugungsmittel (10) und dadurch der Zeit und Rate, gemäß der die Arznei aus der ersten Kammer (6) ausgestoßen wird, enthält.

Revendications

1. Dispositif d'administration de médicaments, comprenant :

   un boîtier (2) d'une taille lui permettant d'être introduit dans une cavité du corps d'un sujet ; ledit boitier (2) étant un matériau insoluble dans les fluides de la cavité du corps, mais étant formé avec une ouverture (4) ;
   un élément (8) pouvant être déplacé, à l'intérieur du boîtier (2) et définissant de première et seconde chambres susceptibles de détente et de contraction (C1, C2) à l'intérieur ;
   ladite première chambre (C1) incluant ladite ouverture (4) et étant adaptée pour recevoir des médicaments devant être délivrés à travers ladite ouverture (4) lorsque ledit dispositif est dans la cavité du corps ;
   et un moyen (10) générant un gaz, pour fournir un gaz à ladite seconde chambre (C2) pour le détendre et ainsi contraindre les médicaments provenant de ladite première chambre (C1) à sortir à travers ladite ouverture (4) pour entrer dans la cavité du corps, caractérisé en ce que ledit moyen (10) générant un gaz est enfermé dans une membrane imperméable au liquide, perméable au gaz.

2. Dispositif selon la revendication 1, dans lequel ledit élément (8) poouvant être déplacé est un diaphragme.

3. Dispositif selon la revendication 1 ou 2, dans lequel ladite ouverture (4) est fermée initialement par un matériau (6) qui est soluble dans les fluides de la cavité du corps.

4. Dispositif selon l'une quelconque des revendications 1-3, dans lequel ledit moyen (10) générant un gaz inclut un moyen (11-14) commandé électriquement pour générer un gaz lorsqu'il est traversé par du courant.

5. Dispositif selon la revendication 4, dans lequel ledit moyen (11-14) commandé électriquement inclut une cellule électrolytique (11-13) ayant un électrolyte (11) générant un gaz en accord avec le courant électrique passé à travers l'électrolyte (11).

6. Dispositif selon la revendication 5, dans lequel ledit dispositif inclut en outre un microprocesseur (14) pré-programmable, pour commander l'envoi de courant électrique à ladite cellule électrolytique (11-13) et ainsi le temps et la vitesse auxquels la médication est contrainte de sortir de ladite première chambre (C1).

7. Dispositif selon la revendication 4, dans lequel la

surface externe du boîtier (2) inclut des éléments (16, 18) en divers métaux, espacés, qui sont reliés en pont par les fluides de la cavité du corps pour générer une force électromotrice, en vue de fournir du courant au moyen (11-14) commandé électriquement.

8. Dispositif selon la revendication 7, dans lequel lesdits éléments (16, 18) en divers métaux sont sous la forme de bandes espacées, enroulées sur la surface externe dudit boîtier.

9. Dispositif selon l'une quelconque des revendications 4-6, dans lequel ledit boîtier (2) inclut une batterie pour fournir du courant au moyen commandé électriquement.

10. Dispositif selon l'une quelconque des revendications 4-9, dans lequel ledit boîtier (2) inclut un détecteur pour détecter une condition dans la cavité du corps et pour commander ledit moyen (11-14) commandé électriquement, en réponse.

11. Dispositif selon l'une quelconque des revendications 4-9, dans lequel ledit boîtier (2) comprend en outre un récepteur de radiofréquence, pour recevoir un signal de radiofréquence, pour commander ledit moyen (11-14) commandé électriquement.

12. Dispositif selon l'une quelconque des revendications 4-9, dans lequel ledit boîtier (2) comprend en outre une commande électrique pouvant être actionnée manuellement, de l'extérieur du boîtier (2), pour actionner ledit moyen (11-14) commandé électriquement.

13. Dispositif selon l'une quelconque des revendications 4-9, dans lequel ledit moyen (11-14) commandé électriquement inclut une commande électrique, actionnée de façon magnétique, par un champ magnétique, à l'extérieur du sujet.

14. Dispositif selon l'une quelconque des revendications 1-13, dans lequel ledit boîtier (2) inclut une gaine externe en un matériau gonflable avec un liquide, qui gonfle lorsqu'il est au contact de fluides de la cavité du corps et se désintègre en un certain temps dans la cavité du corps, pour commander ainsi le temps de séjour du dispositif dans la cavité du corps.

15. Dispositif selon l'une quelconque des revendications 1-14, dans lequel ledit moyen (10) générant un gaz est dans ladite seconde chambre.

16. Dispositif selon l'une quelconque des revendications 1-14, dans lequel ledit moyen générant un gaz est inclus dans un second boîtier qui est fixé au premier boîtier mentionné, lorsqu'il est introduit dans la cavité du corps d'un sujet, et qui est également en un matériau insoluble dans les fluides de la cavité du corps, les deux boîtiers étant formés avec des ouvertures alignées pour alimenter en gaz généré dans ledit second boîtier ladite seconde chambre du premier boîtier mentionné.

17. Dispositif selon l'une quelconque des revendications précédentes, comprenant en outre un bouchon (6) qui est soluble dans les fluides de la cavité du corps, fermant ladite ouverture (4).

18. Dispositif selon l'une quelconque des revendications précédentes, dans lequel ledit dispositif inclut en outre un microprocesseur (14) pré-programmable, pour commander le temps et la vitesse de génération de gaz par ledit moyen (10) générant un gaz, et ainsi le temps et la vitesse auxquels ladite médication est contrainte de sortir de ladite première chambre (6).

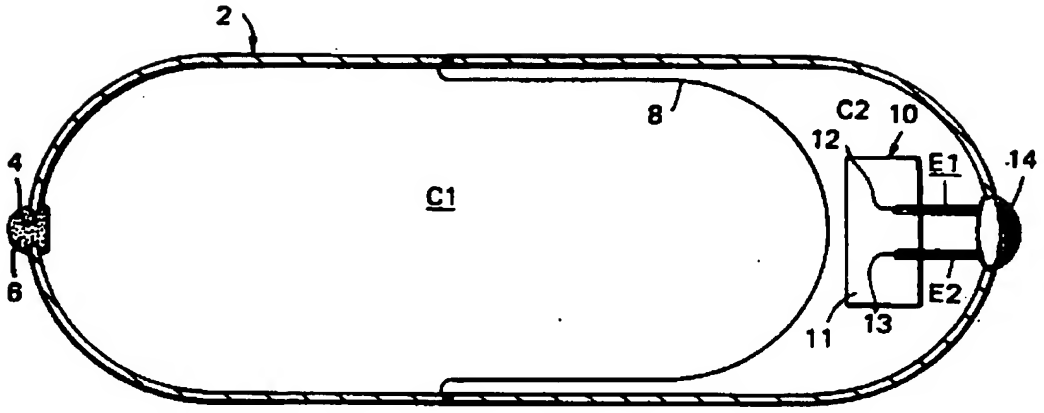

FIG. 1

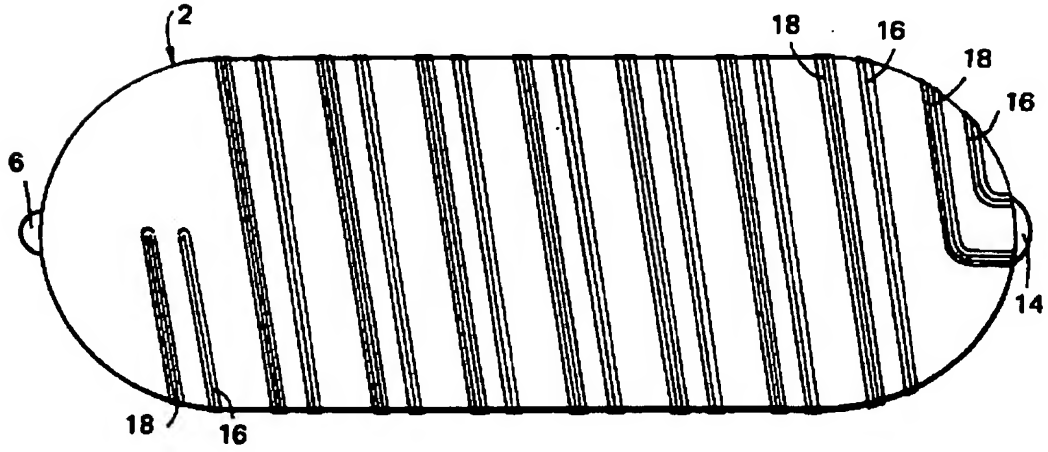

FIG. 2

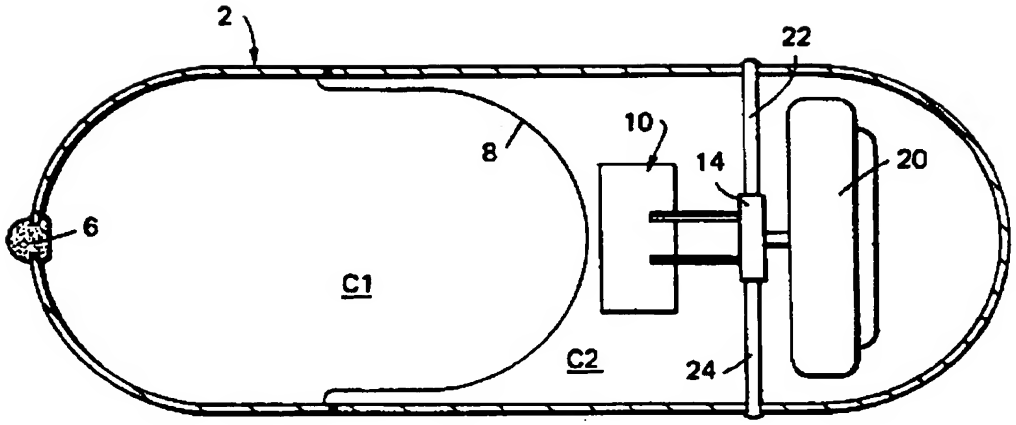

FIG. 3

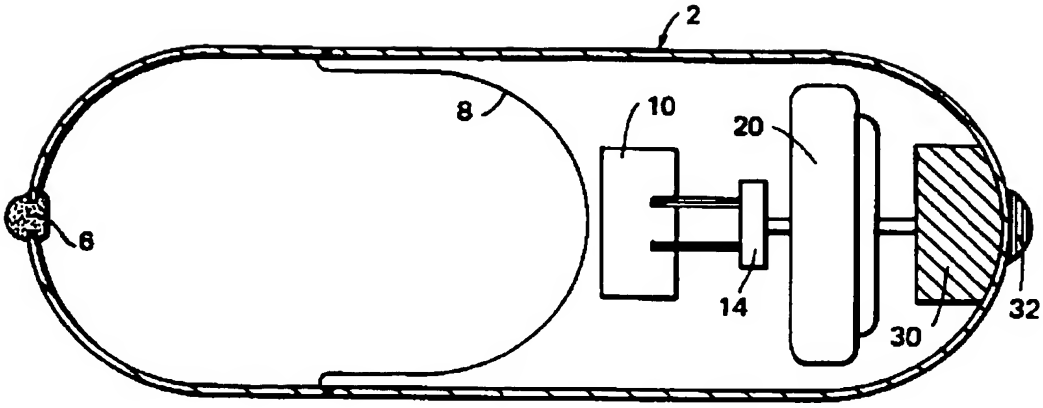

FIG. 4

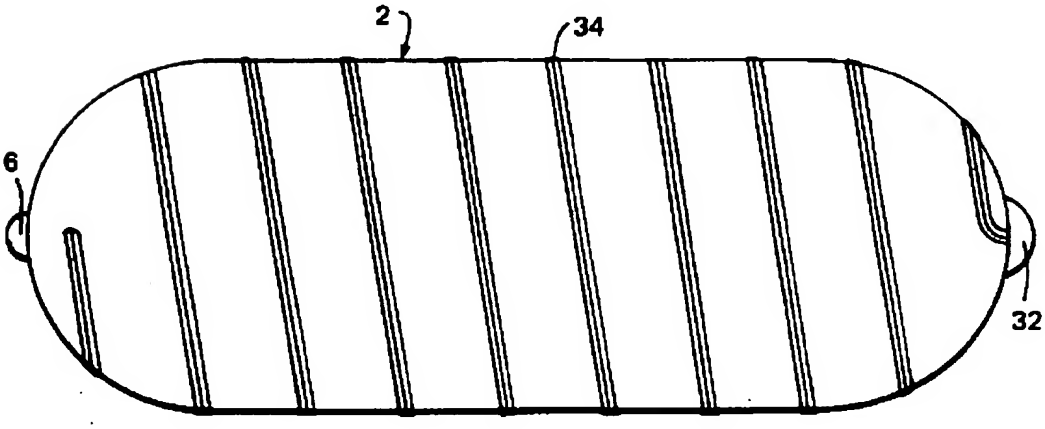

FIG. 5

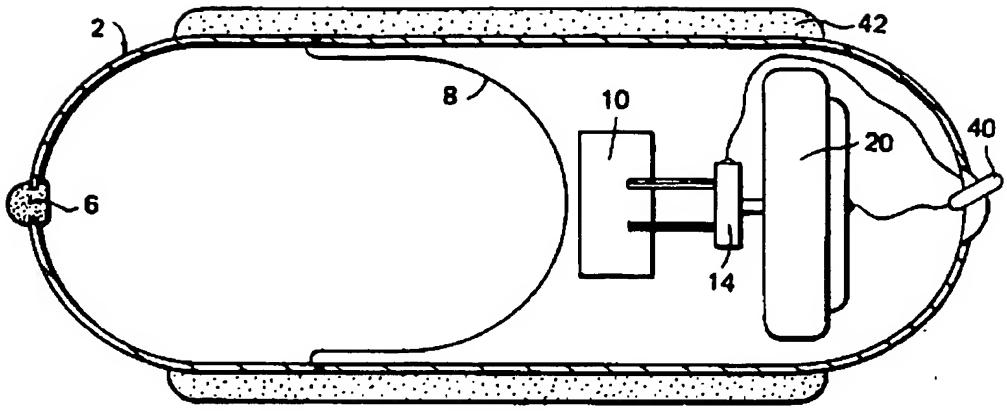

FIG. 6

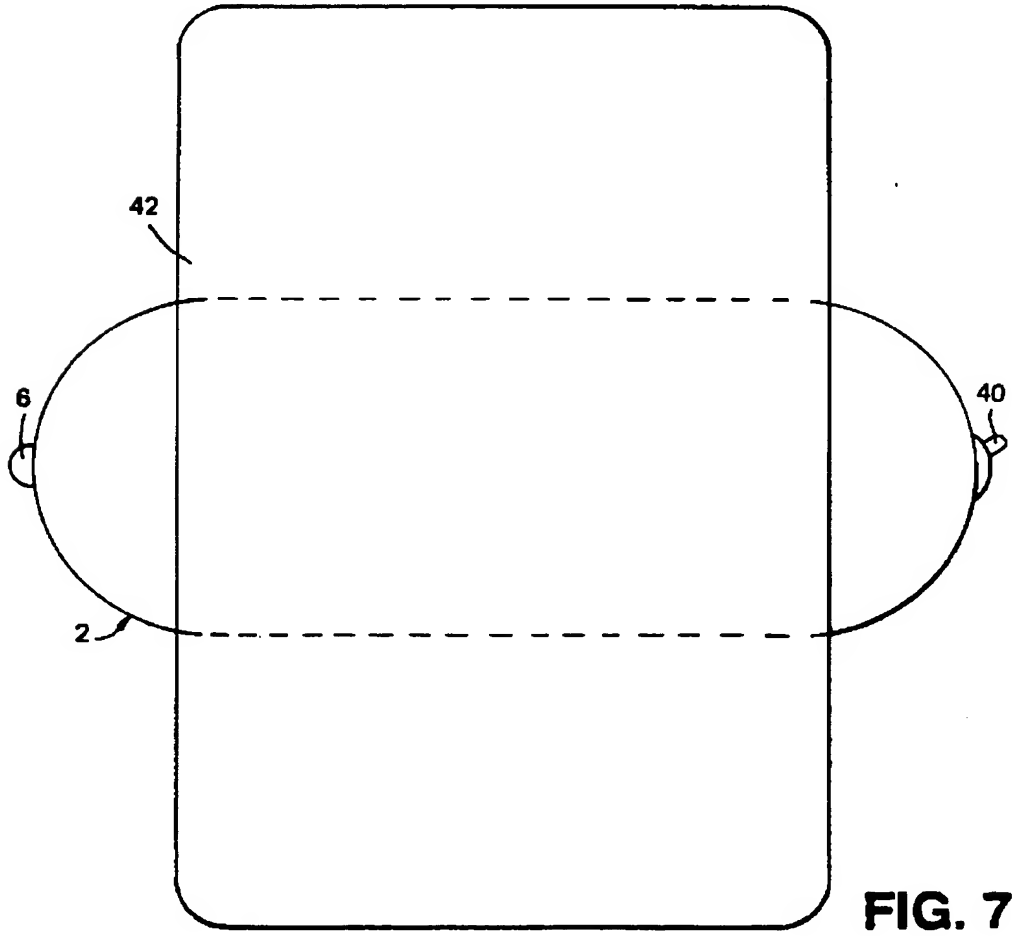

FIG. 7

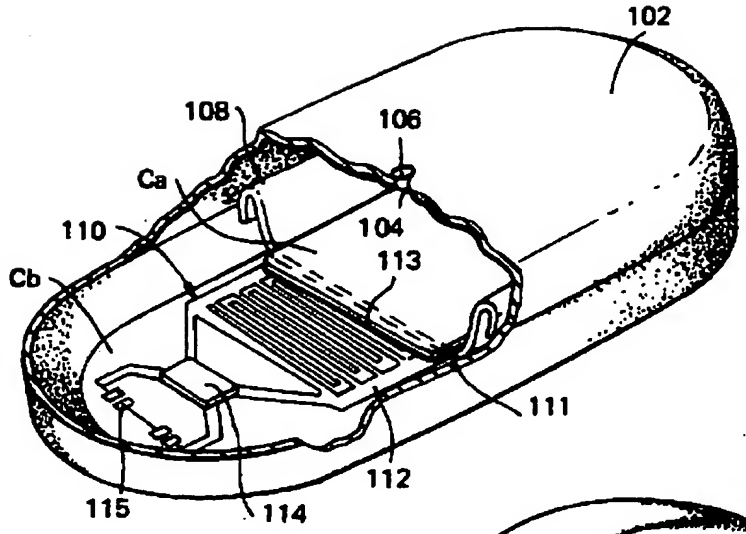

FIG. 8

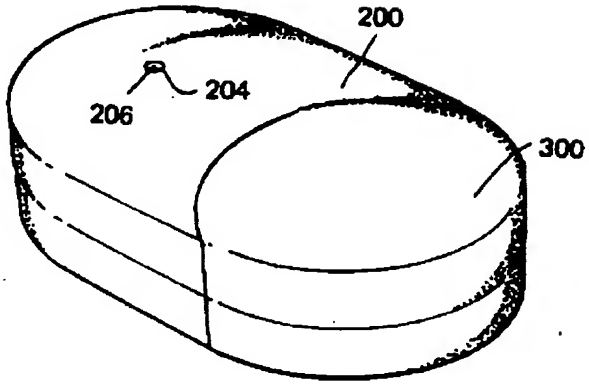

FIG. 9

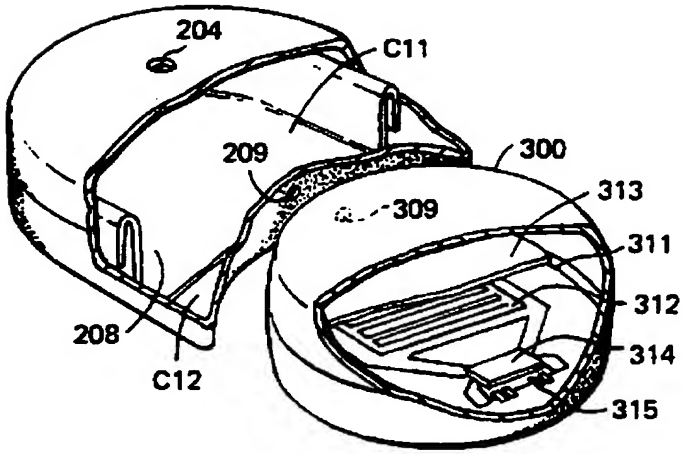

FIG. 10